

REMARKS

I. Introduction

In response to the Office Action dated February 28, 2006, claims 1-9 have been amended. Claims 1-9 remain in the application. Re-examination and re-consideration of the application, as amended, is requested.

II. Non-Art Rejections

In paragraphs (1)-(2) of the Office Action, claims 2, 5 and 8 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the Office Action asserts that the use of the term "smallest" in the phrase "selecting a smallest grouping set from a previous one of the levels" is indefinite.

Applicants' attorney respectfully traverses these rejections.

As set forth in the specification at page 22, line 10 et seq., FIG. 4 illustrates the grouping sets, wherein the grouping sets are represented by boxes arranged in levels. The grouping sets at each level contain the same number of grouping expressions, as represented within parentheses. At runtime, the RDBMS dynamically determines which grouping set to use based upon the sizes of these grouping sets. In this context the size of the grouping set refers to the cardinality or the number of rows in the grouping set.

Consider the description in the specification at page 26, line 18 et seq., which states that the RDBMS determines the cardinalities of the input for each grouping set to select the input with lowest cardinality. Consider also the description in the specification at page 8, line 23 et seq., which states that each GROUPING SETS operation produces a set of rows.

Consequently, the reference to the "smallest grouping sets" in the claims refers to the cardinality or number of records in the grouping set. Based on the description in the specification, there is nothing indefinite about this term. Consequently, Applicants' attorney requests that the objection be withdrawn.

III. Prior Art Rejections

A. The Office Action Rejections

In paragraphs (3)-(4) of the Office Action, claims 1-9 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,963,936 (Cochrane).

Applicants' attorney respectfully traverses these rejections.

B. The Applicants' Independent Claims

Independent claims 1, 4 and 7 are directed to a method, system and article of manufacture for optimizing a query. Claim 1 is representative and recites a method of optimizing a query in a computer system, the query being performed by the computer system to retrieve data from a database stored on the computer system, the method comprising: (a) during compilation of the query, maintaining a GROUP BY clause with one or more GROUPING SETS, ROLLUP or CUBE operations in its original form until after query rewrite; and (b) at a later stage of query compilation, translating the GROUP BY clause with the GROUPING SETS, ROLLUP or CUBE operations into a plurality of levels having one or more grouping sets, and generating a query execution plan with a super group block having an array of pointers, wherein each pointer points to a linked list representing grouping sets for a particular level.

C. The Cochrane Reference

Cochrane describes a method and apparatus for detecting and stacking grouping sets to support GROUP BY operations with GROUPING SETS, ROLLUP and CUBE extensions in relational database management systems, with greatly reduced numbers of grouping sets. A first GROUP BY (element-list1) is input to a second GROUP BY (element-list2), resulting in the GROUP BY of the intersection of the two lists. This intersection property is then useable to reduce the number of GROUP BYs required to implement the grouping by GROUPING SETS, ROLLUPs, and CUBEs required for the online analytical processing of data contained in the database.

D. Applicants' Claims Are Patentable Over The References

Applicants' invention, as recited in independent claims 1, 4 and 7, is patentable over the Cochrane reference, because the claims recite limitations not found in the reference.

Nonetheless, according to the Office Action, Cochrane teaches the "maintaining" element of Applicants' independent claims at col. 7, lines 26-30 and 44-48, and Cochrane teaches the "translating" element of Applicants' independent claims at col. 8, lines 26-42 and Figure 7.

These portions of Cochrane are reproduced below:

Cochrane: Col. 7, Lines 26-30

Generally, the query parser 92 lexes, parses, and semantically checks a query, producing an internal representation (a "query graph model") that is rewritten and submitted to the optimizer which generates an optimized query execution plan.

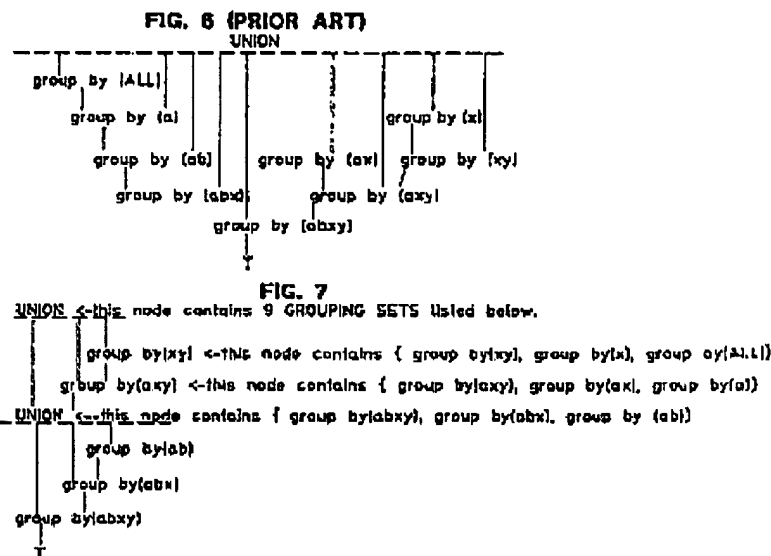
Cochrane: Col. 7, Lines 44-48

The system of FIG. 5 employs the invention to produce a QGM in which the number of GROUP BYs necessary to execute a GROUP BY with multiple GROUPING SETS, concatenated ROLLUPs, or a CUBE has been reduced.

Cochrane: Col. 8, Lines 26-42

Now, utilizing the principles of the present invention, and noting the previously derived intersection results shown above at (1)-(4), it becomes possible to construct a query graph model that includes a stacking of GROUP BYs that results in the computation and planning of only 5 GROUP BYs as opposed to the 9 required in FIG. 6. This query graph model is shown in FIG. 7. It should be emphasized that the query graph model of FIG. 7 produces results that are identical to the solution provided in FIG. 6, with only 5 GROUP BY operations, a considerable economy in computational overhead. Indeed, this reduction in the number of GROUP BYs may, in an RDBMS implementing large multi-dimensional tables and subject to complex OLAP queries, be necessary to implement the query. This is due to the fact that the size of such queries, combined with the prior art, can require such large-scale computational assets as to render the query incapable of implementation.

Cochrane: Figure 7



Nothing in the description from Cochrane set forth above teaches or suggests the claim limitations directed to “during compilation of the query, maintaining a GROUP BY clause with one or more GROUPING SETS, ROLLUP or CUBE operations in its original form until after query rewrite,” and “at a later stage of query compilation, translating the GROUP BY clause with the GROUPING SETS, ROLLUP or CUBE operations into a plurality of levels having one or more grouping sets, and generating a query execution plan with a super group block having an array of pointers, wherein each pointer points to a linked list representing grouping sets for a particular level.”

Instead, the description from Cochrane set forth above merely describes the translation of a query into a “query graph model” that is rewritten and submitted to an optimizer which generates an optimized query execution plan, wherein the optimization of GROUP BYs is performed by stacking, which reduces the number of GROUP BYs while producing identical results.

However, this optimization scheme of Cochrane does not maintain the GROUP BYs in their original form until after query rewrite. Instead, the optimization scheme of Cochrane reduces the GROUP BYs during query rewrite.

Moreover, this optimization scheme of Cochrane does not generate a query execution plan with a super group block. Indeed, Cochrane says nothing about super group blocks having an array of pointers, wherein each pointer points to a linked list representing grouping sets for a particular level.

Thus, Applicants submit that independent claims 1, 4 and 7 are allowable over Cochrane. Further, dependent claims 2, 3, 5, 6, 8 and 9 are submitted to be allowable over Cochrane in the same manner, because they are dependent on independent claims 1, 4, and 7, respectively, and thus contain all the limitations of the independent claims. In addition, dependent claims 2, 3, 5, 6, 8 and 9 recite additional novel elements not shown by Cochrane.

IV. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

Respectfully submitted,

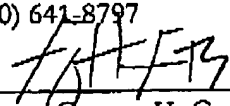
GATES & COOPER LLP
Attorneys for Applicants

Howard Hughes Center
6701 Center Drive West, Suite 1050
Los Angeles, California 90045
(310) 641-8797

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GHG/bjs

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By: 
Name: George H. Gates
Reg. No.: 33,500